Name: ________________________ Date: ____________

Polynomial Operations SOLUTION (version 201)

1. Let polynomials $p(x)$ and $q(x)$ be defined below.

$$p(x) = -10x^5 - x^4 - 5x^3 + 8x + 7$$

$$q(x) = 9x^5 + 8x^4 - x^2 - 5x - 4$$

Express the difference $p(x) - q(x)$ in standard form.

Get "unsimplified" forms. Then find $p(x) - q(x)$ with addition/subtraction.

$$\begin{aligned}
p(x) &= (-10)x^5 + (-1)x^4 + (-5)x^3 + (0)x^2 + (8)x^1 + (7)x^0 \\
q(x) &= (9)x^5 + (8)x^4 + (0)x^3 + (-1)x^2 + (-5)x^1 + (-4)x^0 \\
p(x) - q(x) &= (-19)x^5 + (-9)x^4 + (-5)x^3 + (1)x^2 + (13)x^1 + (11)x^0 \\
p(x) - q(x) &= -19x^5 - 9x^4 - 5x^3 + x^2 + 13x + 11
\end{aligned}$$

2. Let polynomials $a(x)$ and $b(x)$ be defined below.

$$a(x) = -8x^2 + 3x + 2$$

$$b(x) = 3x - 5$$

Express the product $a(x) \cdot b(x)$ in standard form.

You can use a table for multiplication.

*	$-8x^2$	$3x$	2
$3x$	$-24x^3$	$9x^2$	$6x$
-5	$40x^2$	$-15x$	-10

$$a(x) \cdot b(x) = -24x^3 + 9x^2 + 40x^2 + 6x - 15x - 10$$

Combine like terms.

$$a(x) \cdot b(x) = -24x^3 + 49x^2 - 9x - 10$$

3. Express $(x + 1)^5$ in standard (expanded) form.

Remember the binomial theorem. It tells us to use Pascal's triangle.

$$x^5 + 5x^4 + 10x^3 + 10x^2 + 5x + 1$$

Polynomial Operations SOLUTION (version 201)

4. Let polynomials $f(x)$ and $g(x)$ be defined below.

$$\begin{aligned} f(x) &= -x^3 - 12x^2 - 28x + 29 \\ g(x) &= x + 8 \end{aligned}$$

The quotient of $\frac{f(x)}{g(x)}$ can be expressed as a polynomial, $h(x)$, and a remainder, R (a real number).

$$\frac{f(x)}{g(x)} = h(x) + \frac{R}{x+8}$$

By using synthetic division or long division, express $h(x)$ in standard form, and find the remainder R.

I prefer using synthetic division.

	-1	-12	-28	29
-8		8	32	-32
	-1	-4	4	-3

So,

$$\frac{f(x)}{g(x)} = -x^2 - 4x + 4 + \frac{-3}{x+8}$$

In other words, $h(x) = -x^2 - 4x + 4$ and the remainder is $R = -3$.

5. Let polynomial $f(x)$ still be defined as $f(x) = -x^3 - 12x^2 - 28x + 29$. Evaluate $f(-8)$.

You could do this the hard way.

$$\begin{aligned} f(-8) &= (-1)\cdot(-8)^3 \;+\; (-12)\cdot(-8)^2 \;+\; (-28)\cdot(-8) \;+\; (29) \\ &= (-1)\cdot(-512) \;+\; (-12)\cdot(64) \;+\; (-28)\cdot(-8) \;+\; (29) \\ &= (512) \;+\; (-768) \;+\; (224) \;+\; (29) \\ &= -3 \end{aligned}$$

Or, if you reference the polynomial remainder theorem, you can state that you know $f(-8)$ equals the remainder when $f(x)$ is divided by $x+8$. Thus, $f(-8) = -3$.